

FOUNDATIONS OF TECHNOLOGY

Levels: Grades 9-10

Units of Credit : Semester (.5-1.0)

CIP code: 210104

Prerequisites: None

Recommended Text: Technology, by R. Thomas Wright (Goodheart- Willcox Company, Inc.
ISBN #1-59070-159-3)

COURSE DESCRIPTION

“Foundations of Technology” is an action-based engineering and technology educational course emphasizing design and problem solving techniques, and understanding the following technical systems: communication, electrical, fluid, mechanical, and structural. In this course students develop an understanding of how these systems evolved, are utilized, and the significance that they have in our history and at the present time.

It is designed to nurture students to become technologically literate productive citizens who exhibit appropriate critical thinking, problem solving and team work skills.

STANDARD 210104-01	Students will understand the importance of technology and how it impacts our lives. (Align with National Technology Content Standards: 1-7)
Objective 210104-0101	Students will recognize that technology is how humans modify the world around them to meet their needs and wants or to solve problems and extend their capability.
Objective 210104-0102	Students will describe and compare the relationships of technology and science.
Objective 210104-0103	Students will explain both positive and negative impacts of technology on our society, environment, and economy. Ethical implications will also be described.
Related Vocabulary	technology, science, impacts, society, environment, economy, ethical
STANDARD 210104-02	Students will understand the components of the basic technological system model. (Align with National Technology Content Standards: 2)
Objective 210104-0201	Students will identify how communication, electrical, fluid, mechanical, and structural systems may be used in these seven areas: communication, construction, manufacturing, transportation, bio-medical, agriculture and power and energy.
Objective 210104-0202	Students will describe the basic technological system model which includes input, process, output, and feedback and control.
Objective 210104-0203	Students will identify the technological system inputs (resources) as materials, time, energy, tools/machines, capital, information, and human resources. They will discuss management strategies of resources including the following: reducing, recycling, reusing, and renewing resources.
Objective 210104-0204	Students will identify and explain the three major types of processes for technological systems as problem solving/design, production and management.
Objective 210104-0205	Students will recognize and be able to discuss system outputs as having desirable and undesirable, intended and unintended, and immediate and delayed aspects.
Related Vocabulary	communication, construction, manufacturing, transportation, medical, agriculture, power and energy, input, process, output, feedback, control, system, reduce, recycle, reuse, renew, resources, materials, time, energy, tools, machines, capital, finances, information, human resources, data, system model, problem solving, design, production, management, desirable, undesirable, intended, unintended, immediate and delayed

STANDARD 210104-03	Students will understand and apply design principles in developing a process, product or system. (Align with National Technology Content Standards: 2-3, 8-13)
Objective 210104-0301	Students will understand and apply design principles including the following: structure, function, appearance, safety, durability, reliability, economic and financial feasibility, marketability, quality control, environmental impacts, manufacturability, maintainability, and human factors engineering (ergonomics), ease of use, ease of assembly, social appropriateness.
Objective 210104-0302	Students will classify technologies as inventions or innovations. They will also be able to identify how technological innovations are created or enhanced through connections to other fields of study.
Objective 210104-0303	Students will understand the concepts and value of planned failure, durable goods and non-durable goods.
Objective 210104-0304	Students will assess trade-offs in terms of the outputs of technological systems. They will also be able to analyze trade-offs in optimizing product design.
Related Vocabulary	design principle, structure, function, appearance, safety, strength, durability, reliability, economic and financial feasibility, marketability, quality control, environmental impacts, manufacturability, maintainability, human factors engineering, ergonomics, ease of use, ease of assembly, socially appropriate, invention, innovation, planned failure, durable good, non-durable good, trade-offs, optimize, product design
STANDARD 210104-04	Students will describe and apply the basic steps in the design/problem solving process. Students will document the design process in a portfolio. Stage 1: Problem Statement and Design Brief Stage 2: Investigation and Research Stage 3: Generate alternative solutions Stage 4: Choose the best solution Stage 5: Modeling and prototyping Stage 6: Test and evaluate (Align with National Technology Content Standards: 8-13)
Objective 210104-0401	Students will utilize design briefs and specifications (criteria and constraints) in order to maximize a solution in their design work. Students will differentiate between a problem/opportunity and a solution.
Objective 210104-0402	Students will investigate and research data that will be useful in developing a design solution using a variety of mediums which may include the following: interview, Internet, databases, books, magazines, video, observation, measurement, and surveys.
Objective 210104-0403	Students will brainstorm and creatively generate a multitude of possible solutions to the stated problem or opportunity.
Objective 210104-0404	Students will analyze potential solutions based on design principles (see standard 3) and make a decision as to the best solution.
Objective 210104-0405	Students will implement the chosen solution. They will develop and communicate their design using technical sketching and/or drawing techniques, make graphical, mathematical and/or physical models and prototypes.
Objective 210104-0406	Students will test their design for features such as durability, ease of assembly, reliability, strength, environmental impact, quality, safety and other design principles (see standard 3).
Objective 210104-0407	Students will prepare an evaluation of the design product. This should include an evaluation of the product, the process and themselves.

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Objective 210104-0408	Students will present their solution in a professional manner using a portfolio which may include: engineering drawings, posters, models, power point presentations, web site, or other appropriate methods.
Related Vocabulary	design/problem solving process, problem, opportunity, potential solution, solution, design brief, criteria, constraints, specification, investigate, research, data, information, personal interview, Internet, database, observation, measurement, survey, brainstorm, analyze, graphic model, mathematical model, physical model, prototype, testing, evaluation, portfolio
STANDARD 210104-05	Students will use resources, tools, materials, and processes safely and efficiently. (Align with National Technology Content Standards: 14-20)
Objective 210104-0501	Students will follow general laboratory safety practices.
Objective 210104-0502	Students will follow specific equipment safety practices.
Objective 210104-0503	Students will identify potential safety hazards and make appropriate precautions or corrections.
Objective 210104-0504	Students will be able to describe manufacturing processes for changing materials which are: casting and molding, forming, separating, conditioning, assembling, and finishing.
Objective 210104-0505	Students will use tools, equipment, materials, and processes to produce a working model or prototype of a solution to a technical problem.
Related Vocabulary	Safety, hazards, precautions, casting, molding, forming, separating, conditioning, assembling, and finishing, equipment, materials, and processes
STANDARD 210104-06	Identify components and properties, build a representation and perform operations associated with communication, electrical, mechanical, fluid, and structural systems. (Align with National Technology Content Standards: 11-20)
Objective 210104-0601	Students will be able to communicate an idea graphically using sketches, isometric drawings, orthographic drawings, schematics, charts, and graphs using either sketching mechanical drawing or computer-aided design (CAD) techniques.
Objective 210104-0602	Students will define and explain the following electronic terms and concepts: electricity, electronics, conductor, insulator, semi-conductor, series circuit and parallel circuit, voltage, current, and resistance.
Objective 210104-0603	Students will assemble an electronic circuit. They will understand the use of schematics, function of basic electronic components, and electronic measurement.
Objective 210104-0604	Students will define and explain the characteristics of mechanical system functions being that of changing speed, power, distance, and direction and apply them in mechanical systems.
Objective 210104-0605	Students will assemble a mechanical system using gears, pulleys and levers. They will understand the basic components of mechanical components and be able to calculate mechanical advantage.
Objective 210104-0606	Students will define and explain advantages and disadvantages of pneumatic versus hydraulic systems (i.e., quick, slow, powerful, clean, dirty, cost, etc.). They will understand the concept of fluid power as it relates to air and liquid.
Objective 210104-0607	Students will assemble a fluid power system. Students will understand the function of the basic fluid power components: pump, tank, valve, cylinder, piston, and actuator and be able to calculate pressure and force in the system.
Objective 210104-0608	Students will be able to define and explain basic structural terminology including: compression, tension, torsion, stress, strain, triangulation, static load, and dynamic load.

Objective 210104-0609	Students will assemble a structural system.
Related Vocabulary	Communicate, rough sketch, isometric drawing, orthographic drawing, engineering drawing, schematic, chart, graph, mechanical drawing, computer-aided design, CAD, electronic circuit, electricity, electronics, conductor, insulator, semi-conductor, series circuit, parallel circuit, ohm's law, voltage, current, resistance, switch, power source, battery, resistor, light emitting diode (LED), capacitor, transistor, integrated circuit (IC), diode, potentiometer, fuse, mechanical, mechanical advantage, ratio, mechanism, pulley, gear, lever, fulcrum, load, effort, pressure, force, speed, power, distance, direction, pneumatic, hydraulic, fluid, liquid, air, pump, tank, valve, cylinder, piston, actuator, structure, structural, compression, tension, torsion, stress, strain, triangulation, static load, dynamic load
STANDARD 210104-07	Integrate the Technology Student Association (TSA) Leadership Program. (Align with National Technology Content Standards: 1-20)
Objective 210104-0701	Students will understand and develop positive work ethics and leadership skills which include: responsibility, cooperation, dependability, delegation, team work, and integrity.
Objective 210104-0702	Participate in sponsored TSA events.
Objective 210104-0703	Participate in service-learning opportunities.
Objective 210104-0704	Recognize accomplishment.
Objective 210104-0705	Develop partnerships with local, state, and national chapters and other organizations.
Related Vocabulary	service-learning, leadership, work ethics, responsibility, cooperation, dependability, delegation, team work, integrity